INTEGRATED DESIGN CHARRETTE REPORT

Town of Cornwall, PEI
Town Hall Project
April 26-27, 2005

By
Sustainable Buildings Canada
1.0 INTRODUCTION

On April 26-27, 2005, The Town of Cornwall, PEI held a two-day Design Charrette for a new town hall. Organizational assistance was provided by Sustainable Buildings Canada (SBC) and key funding support came from NRCan, Federation of Canadian Municipalities, Canadian Geoxchange Coalition, the Cement Association of Canada Atlantic Region, and ADI Engineering. The Charrette attracted 22 participants, representing architects, engineers, planners, town representatives and a variety of technology specialists. Each team consisted of approximately 10 core members, with floating experts circulating among the teams.

Design Charrettes use the “integrated design process” (IDP) to create more environmentally friendly and efficient designs. The integrated design process is a method where designers collaborate in the initial design stages, rather than working in isolation. It challenges them to consider new strategies, systems and products that more appropriately support a sustainable design scheme. An integrated team formed early at the concept stage, can maximize the potential benefits. This is when concepts can change easily as new ideas are considered.

An integrated team includes members with diverse expertise and experience to inform the process including property managers, energy simulators, costing experts, energy efficiency experts, envelope specialists, municipal engineers and planners and alternative energy specialists along with the design team members. These team members work together to achieve a higher performance, value-added building. This multi-disciplinary relationship should continue throughout the design and construction phases.

Sustainable Buildings Canada is pleased to provide the following report and wishes to thank all those involved in making this important event happen, in particular the Town of Cornwall and its planner, Janice Harper, as well as the core funders mentioned above, the facilitators, modelers and experts. Thank you to all.
1.1 PROJECT

The Town of Cornwall, PEI (pop 4412) is in the early design phase for a new town hall. The town has grown out of its present facility and wants to build a new town hall to meet the needs of a growing population.

The program calls for administrative offices, meeting space, council chamber and space for a library and a wellness centre in a 3 storey (including basement) building. The preliminary design by David Lopes of N46 Design comes in at 18,000 sf.

The mayor had stated a desire for a quality building using green building principles. The town has started an FCM GMEF application and sees the town hall as a first step in moving toward a sustainable community.

1.2 CONTEXT

Panoramic view from building site

The site is a greenfield site fronting on the Trans Canada Highway to the north—other adjacent uses include residential to the south, a commercial/residential use to the west and agricultural to the north. The site is already occupied by an arena that is served by a (mostly) paved parking lot and in the future there may be an RCMP detachment built. Plans exist to build a highway bypass and develop the existing highway as a main street.
1.3 Energy Simulation

An EE4 building energy model was developed for the new building construction based on an outline mechanical specification and a building envelope described below.

<table>
<thead>
<tr>
<th>Building Shell</th>
<th>Design</th>
<th>Minimum MNECB GSHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Average window to wall area ratio</td>
<td>19.5 %</td>
<td>Same as Design</td>
</tr>
<tr>
<td>2. Overall window U-value 6.4 mm Argon Low e (0.2) DG</td>
<td>2.51</td>
<td>2.1 W/m²°C (0.36 Btu/ft²°F)</td>
</tr>
<tr>
<td>3. Window Shading Coefficient</td>
<td>0.45</td>
<td>Same as Design</td>
</tr>
<tr>
<td>4. Overall wall R-Value</td>
<td>RSI 2.70 (R 15.4)</td>
<td>RSI 2.70 (R 15.4)</td>
</tr>
<tr>
<td>5. Roof Type (BUR, Attic)</td>
<td>Attic</td>
<td>Same as Design</td>
</tr>
<tr>
<td>6. Overall roof R-Value</td>
<td>RSI 6.3 (R35.5)</td>
<td>RSI 7.1 (R 40)</td>
</tr>
</tbody>
</table>
2.0 CHARGES TO THE TEAMS


Blue Team – Commercial Building Incentive Program (CBIP) funding requires a building at least 25% more efficient than the Model National Energy Code for Buildings (MNECB). The Blue team’s challenge was to achieve 50% or better than MNECB.

Challenge to both – zero CO\textsuperscript{2} from fossil fuels

2.1 Red Team

SITING
Slight rotation of building to face solar south
- maximizes access to sun
- aligns building with Trans-Canada Highway which future plans designate as the town’s Main Street (after the highway is rerouted). Makes a more urban relationship between the building and the road

HVAC
Reduce space heating to 16 C in lobby and raise the air conditioning setpoint to 26 C from 24 C during occupied periods
Revised Energy:

<table>
<thead>
<tr>
<th></th>
<th>kWh/yr</th>
<th>$/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed</td>
<td>213,403</td>
<td>26,015</td>
</tr>
<tr>
<td>Reference</td>
<td>341,638</td>
<td>41,920</td>
</tr>
</tbody>
</table>

This measure reduces operating costs, but the reference bldg was reduced even more, thereby reducing savings from 38.8% to 37.5%

Existing arena investigated as a potential source of waste heat; however it was determined to not be cost effective due to:
- the amount of heat available and
- the capital cost of piping it to the town hall site

Discussion of the merits of ground source, radiant, and displacement ventilation as well as natural ventilation options.
- Radiant-
  - “flywheel” effect due to time required to heat up and/or cool down floor seen as compromising user comfort
  - wood frame may have to be upgraded to steel for increased structural load.
  - radiant cooling in summer requires dehumidification.

- Displacement-
• issues of raising floors seen as problematic in areas such as washrooms for WCs
  o not a very large building, displacement typically used in applications with large floor plates.
  o local availability and expertise were cited as problems.
• Ground source –
  o ample water below ground to facilitate ground source heating and cooling.
  o drilling in local soil is easy, very few rock problems in PEI.
  o previous experience in the province for the engineer.
  o reliance on fossil fuel seen as a liability.

Mechanical engineer came back on day 2 with a hybrid scheme using solar to supplement the ground source and eliminate the gas-fired boiler. (See appendix 3.01, page 19)

Discussion of easier ventilation for an open plan led to a fundamental architectural change in the building plan and section.

ARCHITECTURAL
  ▪ replacement of perimeter offices with workstations (by architect and approved by mayor) resulted in elimination of two corridors and reduced building width by 8 feet
  ▪ building length was reduced by shortening Wellness/Library stack by 20 feet
  ▪ total reduction in building area from 18,000 sf to 12,600 sf
  ▪ reduction in footprint from 6,000 sf to 4,200 sf
- central space flipped north to south - washrooms now on north side - increases solar exposure and gain
- addition of south facing glazed buffer in central space to harvest heat
- building section
  - supporting structure added along east-west central spine
  - 9 foot ceiling at the perimeter with 8 foot ceiling in east-west central spine
  - HVAC feed from centre
- New section lowered building by 2 feet

Revised Energy for reduced footprint:

<table>
<thead>
<tr>
<th></th>
<th>kWh/yr</th>
<th>$/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed</td>
<td>164,332</td>
<td>20,009</td>
</tr>
<tr>
<td>Reference</td>
<td>262,668</td>
<td>31,965</td>
</tr>
</tbody>
</table>
LIGHTING

• Replace T8s with T5 in all occupied spaces
  NRCan TOP EMT Grant $20/fixture (replace approx. 120 fixtures) on top of CBIP

  Revised Energy for T5 fixtures:
  \[
  \begin{array}{cc}
  \text{Proposed} & 155,196 \\
  \text{Reference} & 262,668 \\
  \end{array}
  \]

  $/yr
  \[
  \begin{array}{cc}
  \text{Proposed} & 18,876 \\
  \text{Reference} & 31,965 \\
  \end{array}
  \]

  41% better than MNECB

LIGHTING plus OCCUPANCY SENSORS

• To T5 replacement add daylighting sensors (on/off) on perimeter spaces and occupancy sensors in all occupied spaces

  Revised Energy:
  \[
  \begin{array}{cc}
  \text{Proposed} & 149,084 \\
  \text{Reference} & 262,668 \\
  \end{array}
  \]

  $/yr
  \[
  \begin{array}{cc}
  \text{Proposed} & 18,128 \\
  \text{Reference} & 31,965 \\
  \end{array}
  \]

  43.2% better than MNECB

INCREASED SOUTH GLAZING

• In addition to T5 and sensors, south glazing doubled from 17% of wall area to 35%

  Revised Energy:
  \[
  \begin{array}{cc}
  \text{Proposed} & 150,142 \\
  \text{Reference} & 270,960 \\
  \end{array}
  \]

  $/yr
  \[
  \begin{array}{cc}
  \text{Proposed} & 18,276 \\
  \text{Reference} & 32,894 \\
  \end{array}
  \]

  44.5% better than MNECB
SOLAR DOMESTIC HOT WATER

- Install a solar DHW system (obtain a REDI grant for 50% cost) Calcs based on 300 L/day hot water usage at 48°C. System capable of providing 50% hot water needs
  This measure is in addition to T5, sensors and increased south glazing

Revised Energy:

<table>
<thead>
<tr>
<th></th>
<th>kWh/yr</th>
<th>$/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed</td>
<td>146,664</td>
<td>17,796</td>
</tr>
<tr>
<td>Reference</td>
<td>270,960</td>
<td>32,894</td>
</tr>
</tbody>
</table>

46% better than MNECB

LEED SCORING

LEED: Sustainable Sites

<table>
<thead>
<tr>
<th>Prereq</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4.1</th>
<th>C4.2</th>
<th>C4.3</th>
<th>C4.4</th>
<th>C5.1</th>
<th>C5.2</th>
<th>C6.1</th>
<th>C6.2</th>
<th>C7.1</th>
<th>C7.2</th>
<th>C8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

6 pts out of 14

LEED: Water Efficiency

| C1.1 | Water Efficient Landscaping: 50% Reduction | 1 |
| C1.2 | Water Efficient Landscaping: 100% Reduction | 1 |
| C2   | Innovative Wastewater Technologies | |
| C3.1 | Water Use Reduction: 20% | 1 |
| C3.2 | Water Use Reduction 30% | |

3 pts out of 5

LEED Energy & Atmosphere

<table>
<thead>
<tr>
<th>Prereq</th>
<th>Building Commissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prereq</td>
<td>Minimum Energy Performance (CBIP)</td>
</tr>
<tr>
<td>Prereq</td>
<td>CFC Reduction: HVAC Eqpt</td>
</tr>
<tr>
<td>C1</td>
<td>Optimize Energy Performance (45%)</td>
</tr>
<tr>
<td>C2.1</td>
<td>Renewable Portion: 5%</td>
</tr>
<tr>
<td>C2.2</td>
<td>Renewable Portion: 10%</td>
</tr>
</tbody>
</table>
C2.3  Renewable Portion: 20%
C3    Best Practice Commissioning
C4    Ozone Protection  1
C5    Measurement/Verification  1
C6    Green Power  1

8 pts out of 17

LEED: Materials/Resources

Prereq Collection & Storage of Recyclables
C1.1 Building Reuse: 75% Walls, Floor, Roof
C1.2 Building Reuse: 95% Walls, Floor, Roof
C1.3 Building Reuse: 50% Non-structural
C2.1 Construction Waste: 50% Diversion  1
C2.2 Construction Waste: 75% Diversion  1
C3.1 Resource Reuse: 5%
C3.2 Resource Reuse: 10%
C4.1 Recycled Content: 7.5%  1
C4.2 Recycled Content: 15%
C5.1 Regional Materials: 10% Local  1
C5.2 Regional Materials: 20% Local  1
C6    Rapidly Renewable Materials
C7    Certified Wood
C8    Durable Building

5 pts out of 14

LEED: Indoor Environmental Quality

Prereq Minimum IAQ
Prereq Tobacco Smoke Control
C1    CO2 Monitoring  1
C2    Ventilation Effectiveness  1
C3.1 Construction IAQ
C3.2 Construction IAQ, Testing before Occ
C4.1 Low Emitting Adhesives  1
C4.2 Low Emitting Paints/Coatings  1
C4.3 Low Emitting Carpets
C4.4 Low Emitting Composite Wood/Laminate
C5    Indoor Chemical & Pollutant Control  1
C6.1 Perimeter Control Systems  1
C6.2 Non-Perimeter Control Systems  1
C7.1 Thermal Comfort:Compliance  1
C7.2 Thermal Comfort: Monitoring  1
C8.1 Daylighting & Views: 75% of Spaces
C8.2 Daylighting & Views

9 pts out of 15

LEED: Innovation & Design

LEED Accredited Professional  1

34

Rating: LEED SILVER
CONCLUSION-
• The Integrated Design Process resulted in a major redesign that replaced fixed offices with workstations, reduced the length and width of the building and lowered the height of the building. The area of the building was reduced by a third and the cost saving was estimated to be roughly 25%.
• The energy model indicated that efficiency measures would make a building 45% better than the MNECB standard.

For a complete report on the energy model and LEED scoring, please see the appendix.

2.2 Blue Team

SITING
Slight rotation of building to face solar south
• maximizes access to sun
• aligns building with future Main Street
• makes a more urban relationship between the building and the road

SITE
• front entrance to the south side- north face is ceremonial
• storm water retention pond with amphitheatre seating to the west of proposed Town Hall Blvd- acting as:
  o water feature
  o cooling “tower”
  o skating pond
  o heat pump discharge
• park and fountain in front of north façade acting as:
  o water feature
  o cooling “tower”
• native species for park
• grade drop from west to east to facilitate new basement plan

ARCHITECTURAL
• basement plan altered from full to unexcavated west side- grade change allows for bigger windows and more natural light.
• central space flipped north to south - washrooms now on north side- increases solar exposure and gain
• elevator shaft transformed into clock tower/summer ventilation element
• section altered to permit higher windows and greater light penetration
• supporting structure added along east-west central spine
LIGHTING

- Interior Reflectance
  - Ceiling 85%
  - Walls 70%
  - Floors 40%

- Artificial Light
  - T5 fixtures

- Natural Light
  - Solera panels (Sydney, Nova Scotia). Translucent, refracting panels for deeper light penetration near ceiling
  - Glass tuning
- South: high VLT high SHGC
- East/west: high VLT low SHGC low u-value high r-value
- North: high VLT low u-value possibly triple glazed

**HVAC**
- Proposed air preheating system under metal roof
- Future photovoltaic roof when cost-justified

**WATER**
- Solar domestic hot water

**ENERGY MODELING**

An EE4 building energy model was developed for the new building construction based on an outline mechanical specification and an envelope described below.

<table>
<thead>
<tr>
<th></th>
<th>Building Shell</th>
<th>Design</th>
<th>Minimum MNECB GSHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Average window to wall area ratio</td>
<td>19.5 %</td>
<td>Same as Design</td>
</tr>
<tr>
<td>2</td>
<td>Overall window U-value 6.4 mm Argon Low e (0.2) DG</td>
<td>2.51</td>
<td>2.1 W/m2°C (0.36 Btu/ft2°F)</td>
</tr>
<tr>
<td>3</td>
<td>Window Shading Coefficient</td>
<td>0.45</td>
<td>Same as Design</td>
</tr>
<tr>
<td>4</td>
<td>Overall wall R-Value</td>
<td>RSI 2.70 (R 15.4)</td>
<td>RSI 2.70 (R 15.4)</td>
</tr>
<tr>
<td>5</td>
<td>Roof Type (BUR, Attic)</td>
<td>Attic</td>
<td>Same as Design</td>
</tr>
<tr>
<td>6</td>
<td>Overall roof R-Value</td>
<td>RSI 6.3 (R35.5)</td>
<td>RSI 7.1 (R 40)</td>
</tr>
</tbody>
</table>
Base Case Number 1 – Ground Water Heat Pumps

Basic engineering design was found to be 38.9 % more efficient than the reference building which means the base building would qualify for the CBIP program incentive. It uses a ground water heat pump system with one supply and one discharge well.

The results for the reference building are 1,271,420 MJ and $ 44,501 and for the proposed are 776,712 MJ and $ 26,410 for an annual energy cost savings of $ 18,091 and an incentive of $ 36,182.

The team then suggested reducing the lighting power requirements by 50 % using photocell and occupancy control sensors and more efficient lighting (T-5). The construction cost savings were estimated to be $ 28,300.

Case Number 2 – Better Lighting

Improved design was found to be 47.2 % more efficient than the reference building which increases the CBIP program incentive.

The results for the reference building are 1,264,806 MJ and $ 44,186 and for the proposed are 667,909 MJ and $ 22,639 for an annual energy cost savings of $ 21,547 and an incentive of $ 43,094.

The team then suggested adding more insulation to the walls and selective glazing improvements that is triple glazed on the north and more tinting on the west to improve the energy efficiency. The additional construction costs were estimated to be $ 15,900.
Case Number 3 – Better Walls and Windows

The improved design was found to be 47.8 % more efficient than the reference building which increases the CBIP program incentive.

The results for the reference building are 1,264,806 MJ and $ 44,186 and for the proposed are 659,853 MJ and $ 22,334 for an annual energy cost savings of $ 21,852 and an incentive of $ 43,704.

The team then suggested adding heat recovery ventilation with a minimum efficiency of 60 % to improve the energy efficiency. The additional construction costs were estimated to be $ 8,600.

Case Number 4 – Heat Recovery Ventilation @ 60 % effectiveness

The improved design was found to be 51.0 % more efficient than the reference building which increases the CBIP program incentive.

The results for the reference building are 1,254,165 MJ and $ 44,186 and for the proposed are 619,581 MJ and $ 20,914 for an annual energy cost savings of $ 23,272 and an incentive of $ 46,544.

The team then suggested adding adjustable speed drives to the pumps to improve the energy efficiency. The additional construction costs were estimated to be $ 3,000.

Case Number 5 – Add Adjustable Speed Drives to Pumps

The improved design was found to be 52.5 % more efficient than the reference building which qualifies for the CBIP program incentive.

The results for the reference building are 1,254,165 MJ and $ 42,560 and for the proposed are 595,794 MJ and $ 20,282 for an annual energy cost savings of $ 22,278 and an incentive of $ 44,556. The reference case changed which reduced the incentive.

The team then suggested adding increased roof insulation to improve the energy efficiency. The additional construction costs were estimated to be $ 4,700.

Case Number 6 – Increase Roof Insulation to RSI 9.7 (R55)

The improved design was found to be 52.5 % more efficient than the reference building which qualifies for the CBIP program incentive.

The results for the reference building are 1,254,165 MJ and $ 42,560 and for the proposed are 595,151 MJ and $ 20,255 for an annual energy cost savings of $ 22,305 and an incentive of $ 44,610.

The team then suggested adding low flow fixtures to improve the energy efficiency. The additional construction costs were estimated to be $ 100.
Case Number 7 – Add Low Flow Fixtures

The improved design was found to be 55.5% more efficient than the reference building which qualifies for the CBIP program incentive.

The results for the reference building are 1,264,806 MJ and $44,186 and for the proposed are 563,379 MJ and $19,398 for an annual energy cost savings of $24,788 and an incentive of $49,576. The reference case reverted to the first case which increased the incentive.

The team then suggested adding solar domestic hot water to improve the energy efficiency. The additional construction costs were estimated to be $6,000.

Case Number 8 – Add Solar Thermal Hot Water

The improved design was found to be 57.0% more efficient than the reference building which qualifies for the CBIP program incentive.

The results for the reference building are 1,264,806 MJ and $44,186 and for the proposed are 538,730 MJ and $18,549 for an annual energy cost savings of $25,637 and an incentive of $51,076.

The team then suggested adding solar warm air to improve the energy efficiency. The additional construction costs were estimated to be $10,000.

Case Number 9 – Add Solar Hot Air

The improved design was found to be 62.6% more efficient than the reference building which qualifies for the CBIP program incentive.

The results for the reference building are 1,264,806 MJ and $44,186 and for the proposed are 468,920 MJ and $16,145 for an annual energy cost savings of $28,040 and an incentive of $49,576.

Red Team design energy performance:

☑ This design is projected to use between 55-63% of the energy of the reference building for the Model National Energy Code for Buildings.
☑ The design could meet the mandatory requirements of LEED-Canada and would likely achieve 6 LEED EA-1 credits for energy performance.

Specific Energy Modeling notes:

☑ Solar DHW heating: savings 22.92 GJ. Using 11 sq-m of collector would provide 39% of the total domestic hot water heating load.
☑ Solar Warm Air heating: savings 69.8 GJ. Using 25 sq-m of collector would provide 13% of the total space heating load.

The solar thermal system is eligible for $1,500 from REDI but the solar warm air may not be since it is a US developed system.
3.0 APPENDIX

3.0.1 Heating and Air Conditioning

.1 General

An energy transfer system will be incorporated into the design of the HVAC systems for this facility and is shown schematically on enclosed drawing CM-1 (page 8).

The main component of the system is the Heat Transfer Loop which provides heat to, or takes heat from all of the systems connected to the loop and is maintained between 50°F and 85°F.

Supplementary heat is provided to the loop through a solar collector system. As solar energy is available it will be stored in a collector tank and transferred to heat transfer storage tank through a water to water heat pump as required. Any additional heating energy when solar is not available will be provided through a water to water heat pump.

External cooling is provided to the loop, as required, from well water. It is anticipated that one (1) supply well will be required to provide heating or cooling to the loop and one (1) return well to reject excess energy back to the ground water.

.2 Heating/Cooling:

The heating and air conditioning will be provided through water source heat pump units connected to heat transfer loop. The units will be able to maintain the space within the acceptable ranges of operative temperature for both summer and winter as outlined in ASHRAE Standards for spaces to be air conditioned.

.3 Outdoor Air Requirements:

Outdoor air will be provided at rates in accordance with the ASHRAE Standards. The outdoor air would be tempered through heat pumps, heat recovery where practical and preheated by passing outdoor air through the solar collector.

Humidity:

Humidity will be provided by electric humidifiers to maintain 30% R.H. in office spaces in accordance with requirements of P.E.I. O.H. & S.

Exhaust Ventilation:

Washrooms - 50 cfm per fixture.

General - Exhaust required to balance the outdoor air requirements
3.0.2 LEED Overview

LEED has established six categories of features that are considered worthy of superior environmental and energy efficient design.

1. Sustainable Sites (14 possible points)
2. Water Efficiency (5 possible points)
3. Energy & Atmosphere (17 possible points)
4. Materials & Resources (14 possible points)
5. Indoor Environmental Quality (15 possible points)
6. Innovation & Design Process (5 possible points)

Within each of the six categories are available design credits, which have point designations used to determine your LEED rating.

Each of the categories and credits will be reviewed for the Cornwall Proposed Town Hall with an indication of whether the credit was achieved.

**Sustainable Sites**

**Erosion and Sedimentation Control (prerequisite)**

Within this category, a prerequisite of “Erosion & Sedimentation Control” exists. The prerequisite requires a sediment and erosion control plan which conforms to the US EPA Document EPA 832/R-92-005, “Storm Water Management for Construction Activities, Chapter 3” or local control standards whichever are more stringent.

The Cornwall Site easily meets this prerequisite as the site is flat and grassed and the design team plans on installing retaining

**Site Selection (1 point earned)**

This credit which the Cornwall Proposed Town Hall qualifies avoids development on ecologically sensitive lands, lands within 30.5 metres of a wetland, lands which was previously designated as parkland, land which was part of a designated agricultural reserve of forest land reserve or land which lower than the 1500 mm from the top of the 100 year flood plan. The design committee felt that the site did conform to the requirements to earn the LEED point.

**Development Density (0 points earned)**

This LEED site credit requires development to be located at site conform to density requirement of 13,000 m2 per hectare. Since this site is located in an open area without a downtown, the development density does not conform to this LEED requirement.

**Redevelopment of Contaminated Sites (0 points earned)**
The LEED requirement relates to the re-use of damaged sites thereby reducing pressure on undeveloped land. This site does not meet this requirement.

**Alternative Transportation, Public Transportation Access (0 points earned)**

This requires siting within 800 metres of a commuter rail or subway station or within 400 metres of 2 or more bus lines. This site does not meet this requirement.

**Alternative Transportation, Bicycles Storage & Changing Rooms (1 point earned)**

This credit requires the installation of a secure bike storage and shower facilities for 5% of the regular building occupants. The original design did not contain any shower facilities, however the design team recommends the installation of male/female shower and washroom facilities in the basement near the rear entrance of the building. Further discussion and investigation is required to determine if the shower and washroom facilities could be further utilized as a community based facility. The location of the showers/bathroom may also be moved from the basement south entrance to the basement north entrance depending on plumbing and other design conditions. Bicycle storage would be outside of the building.

**Alternative Transportation, Alternative Fuel Vehicles (0 points earned)**

This credit requires provision of hybrid or alternative fuel vehicles for 3% of the building occupants or the installation of alternative fuel refilling stations within 500 metres of the site for 3% of the parking capacity. This credit was not achieved.

**Alternative Transportation, Parking Capacity (1 point earned)**

This credit limits land use for parking. The parking capacity must meet but not exceed local zoning and preferred parking provided for car pools, vanpools or car co-ops equal to 10% of non-visitor spots. The design team will meet the minimum requirements of the zoning and designate preferred parking areas. In large public events, arrangements will be made to utilize parking of the adjacent arena facility.

**Reduced Site Disturbance, Protect and Restore Open Spaces (0 points earned)**

This requirement limits disturbance of natural areas to no more than 12 metres of the building perimeter, 1.5 meters beyond primary roadways and walkways and 7.5 meters beyond constructed areas with permeable surfaces. The design team felt this was not attainable given the parking lot construction requirements.

**Reduced Site Disturbance, Development Footprint (1 point earned)**

The development footprint (building, walkways, roadways, parking) must exceed the local open space requirement by 25%. The province has instituted a 10% parkland requirement, therefore the minimum requirement is 12.5% parkland. The entire site is 7 acres (28,300 m2). The proposed building area is 1,742 m2 and the parking, walkways, roadways should amount to another 5000 m2. Therefore the total development area should not exceed 7,000 m2 or only 25% total site, thereby permitting substantial open space requirements to meet the LEED requirement.
**Stormwater Management, Rate and Quantity (1 point earned)**

Provide proof that post development 1.5 year, 24 hour peak discharge rate and quantity does not exceed the pre-development 1.5 year 24 hour discharge rate and quantity. The site is naturally grassed and contains a stormwater retention area. The design team is considering vegetation and parking lot pavers to limit storm runoff. The pavers would improve the permeability of the parking lot. Grasped parking dividers or actual spaces were considered but rejected due to snow removal issues.

Additional landscaping and a possible front courtyard type retention pond were also considered to achieve this credit.

**Stormwater Management, Treatment (0 points earned)**

This credit requires the treatment of the stormwater run-off in terms of quality returned to the natural eco-system by removing 80% of suspended solids(silt) an 40% of the total phosphorous based upon average annual deposits resultant from normal storms (storms of less than the 2-year, 24 hour storm). The design team were unsure whether the current stormwater management plan of swales and natural vegetation would be sufficient, and there was not a consensus on expanding the vegetative plantings.

**Heat Island Effect, Non-Roof (0 points earned)**

This LEED credit incorporates a number of alternatives to reduce the temperature difference between developed and undeveloped areas. The design team discussed these, but ultimately felt the costs outweighed the benefits.

A LEED option involves the use of light-coloured building materials and open-grid pavement for 30% of the site’s non-roof impervious surfaces. The design team looked at pavers and open grid/grassed parking surfaces but felt the snow removal and maintenance difficulties would have a large operational cost penalty.

Another LEED option of providing 50% of the parking underground or enclosed in a structure was cost prohibitive.

**Heat Island Effect, Roof (0 points earned)**

This LEED requirement attempts to reduce the heat generated from roofing materials. The credit requires the installation of a green roof encompassing 75% of the total roof area or the use of EnergyStar compliant high reflective and high emissivity roofing materials for 75% of the roof. The design team considered different roofing materials which would meet the high reflective and high emissivity requirements, but were unsure whether the painted metal or light coloured asphalt shingles would suffice.

**Light Pollution Reduction (1 point earned)**

This requirement ensures that lighting stays within the site and does not contribute to sky lighting. The specific requirement relates to light shielding of exterior lighting.
fixtures such that the light is directed at the building and not the sky. In addition lighting fixtures mounted on poles near property lines must have shielding to discourage light trespassing property boundaries. The design team felt that exterior lighting could be installed such that the light can be directed downward on the building. Light poles within the parking lot and walkways would have downward reflectors and guards and the luminaries positioned lower to the ground to minimize lighting the sky. This would require additional poles to accommodate the lighting needs of the parking lot and walkways.

Sustainable Sites: Summary

The design team felt that with specific design changes and attention to details, a possible score of 6 out of 14 points were attainable.

Water Efficiency

Water Efficient Landscaping, Reduce by 50% (1 point earned)

The credit requires the reduction in on-site irrigation by 50% over conventional means through the use of captured rain water or recycled site water. The design team did not plan on using irrigation of plants for landscaping.

Water Efficient Landscaping, No Potable Water Use or No Irrigation (1 point earned)

This requires the complete elimination of potable water for landscape irrigation. The design team will consider native plants and minimal landscape planting such that no potable water will be required.

Innovative Wastewater Technologies (0 points earned)

This credit requires a 50% reduction of potable water by sewage or the treatment of 100% of the wastewater on site via tertiary standards.

The design team felt that this requirement was quite difficult to attain in a cost-effective manner.

Water Use Reduction, 20% Reduction (1 point earned)

Reduce water consumption by 20% from LEED provided baseline assumptions of water requirements per fixture (toilets = 6 litres/flush for example). The baseline assumptions are water conserving to begin with, therefore a 20% reduction will require careful fixture selection. The design team felt that the investment in water conserving devices was worthwhile.

Water Use Reduction, 30% Reduction (0 points earned)
A 30% reduction in water use from a conserving baseline was considered by the design team, however the team felt that fixtures meeting these requirements would require a substantial cost premium.

**Water Efficiency: Summary**

The design team felt that with specific design changes and attention to details, a possible score of 3 out of 5 points were attainable.

**Energy & Atmosphere**

**Fundamental Building Systems Commissioning (prerequisite)**

LEED requires that the fundamental building elements and systems are designed, installed and calibrated as intended. The design team plans on full commissioning of all mechanical/electrical systems as per design documents.

**Minimum Energy Performance (prerequisite)**

LEED requires a minimal energy performance of 25% energy use reduction relative to the same design built to the Model National Energy Code for Buildings (MNECB) 1997. A preliminary simulation of the building design (see Appendix A) indicated that the original design is 38.8% better than the corresponding building constructed to the MNECB. The original design is expected to require 776,918 MJ of electricity (215,800 kWh) at a cost of $24,413 annually. The original design incorporated a back-up oil boiler to supplement the ground source heat pump in winter conditions, but the simulation indicated that this was not needed and was therefore removed.

This building is eligible for Natural Resources Canada’s Commercial Building Incentive Program even if the team chose not to pursue LEED recognition.

**CFC Reduction in HVAC&R Equipment (prerequisite)**

This requires a zero use of CFC based refrigerants in HVAC&R systems and zero use of halons in fire suppression equipment. The design team current design meets these requirements.

**Optimize Energy Performance (5 points earned)**

The design team reviewed several initiatives to reduce energy use within the building, which are summarized as follows:

1. central lobby was allowed to operate at 16 C heating setpoint and a 26 C cooling setpoint due to minimal occupancy.

The revised proposed design energy consumption was 37.5% better than the corresponding reference building.
The result of this measure was a reduction in energy savings between the proposed and corresponding reference case. The reference building also operates with reduced heating and cooling temperatures, but its reference energy reduction was greater than the proposed design due to the air handler economizer (free cooling) cycle being able to provide full cooling in the lobby. The proposed design is not simulated with an economizer cycle on the air handler.

2. The building floorplate width was reduced by 8 ft and length was reduced by 20 ft throughout all three floors resulting in a perimeter reduced from 120 ft x 50 ft to 100 ft x 42 ft.

The reduction in floor space amounts to a 5400 ft² reduction which will yield considerable capital cost savings. Originally estimated at a cost of $2 million, a cost consultant indicated that commercial space similar to this design was being constructed for $125/ft². Given a 5400 ft² reduction, capital savings of $400,000 can be expected from the original budget estimate with minimal impact on the accommodation needs and operation of the building.

The reduced floorplate resulted in both the proposed and reference cases being reduced accordingly.

The proposed design now attained an annual energy consumption of 37.5% better than the corresponding MNECB reference design.

3. The next design feature was the installation of T5 lighting in all of the offices, meeting rooms, chambers, wellness spaces, reception areas and the library. The T5 technology should also be available for the Natural Resources Canada Equipment Bonus Program, which is a further incentive above the CBIP program. The Equipment Bonus Program encourages newer technologies, of which T5 lighting should be eligible. The current incentive amounts to $20 per fixture. In total 92 conventional T8 fixtures were replaced with T5 technology.

The impact of the introduction of the T5 technology further reduced the proposed design in comparison with the reference building, which did not change. The proposed design is now 40.9 % better than the MNECB reference.

4. The next design feature was the installation of occupancy sensors within all offices and meeting rooms and storage rooms and daylighting sensors on exterior offices and within the library and wellness spaces. With the redesign of the north and south office from enclosed offices to an open office concept, daylighting sensors to control a group of fixtures improves their cost-effectiveness.

The result of the introduction of occupancy sensors in most offices and storage spaces and daylighting sensors on exterior offices is a further electrical reduction thereby improving the design to 43.2% better than the corresponding reference case.
5. The next option that the design team investigated was an increase in passive solar gains and improved daylighting on the southern walls. It was decided to increase the south facing wall glazing from 19.5% of the wall area to 40% of wall area.

Because of the increased southern exposure and the use of very good windows (double glazed, thermally broken, low e coated and argon filled) the proposed design improved to 44.5% better than the MNECB corresponding reference which also doubled its south facing glazing but was utilizing poorer thermally performing windows.

6. The next option was the use of a solar preheater which would pre-warm the ground water from the ground source thereby improving the performance of the heating and cooling system. A solar collector system with a closed-loop glycol to water heat exchanger would transfer heat to the supply water from the ground water. A collector area of 13.4 m² (144 ft²) was assumed for estimation purposes. The EE4 simulation software is not capable of modelling this arrangement specifically, however and approximation method was used to estimate potential savings. Knowing the pump flow rate of the ground source heat pump configuration (4.7 L/sec), a 13.4 m² solar collector was simulated with a third party pool sizing program. The pool sizing program determines the size of collector necessary for a given temperature rise required which is dependent on the size of the pool. Knowing the pumping rate and the collector size a temperature rise can be estimated. The program calculated a temperature rise of approximately 4 C in the summer and 3 C in the winter months for Charlottetown. The ground water temperatures in the EE4 software were increased by the solar collector created temperature rise to estimate the heat transfer from the exchanger to the ground water.

This effect was minimal on the percentage improvement between the proposed and reference cases, remaining at 45% improvement. This indicates that the ground source heat pump system is operating and sized at peak performance.

7. The final design option that the team considered was solar domestic hot water. Given that the building is a municipal structure, domestic water loads should be small, however hot water loads will increase with the introduction of shower facilities. For this analysis a 300 Litre/day hot water usage was assumed. The solar system simulated was a 2 panel system used in residential applications was capable of reducing hot water usage by 50% or 2800 kWh/yr. This design measure allowed the proposed design to be 46% more energy conserving than the corresponding reference.

Solar water heating is eligible for a Natural Resources Canada grant of 25% of the total installed cost up to a maximum of $6000.00 under the Renewable Energy Deployment Initiative.

Summary

<table>
<thead>
<tr>
<th>Measure</th>
<th>Proposed Design</th>
<th>Reference Design</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kWh/yr</td>
<td>$/yr</td>
<td>kWh/yr</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>Original Design</td>
<td>215,810</td>
<td>24,413</td>
<td>352,774</td>
</tr>
<tr>
<td>Reduced Lobby Temp</td>
<td>213,403</td>
<td>26,015</td>
<td>341,638</td>
</tr>
<tr>
<td>Reduced Floor Area</td>
<td>164,332</td>
<td>20,009</td>
<td>262,668</td>
</tr>
<tr>
<td>T5 office lighting</td>
<td>155,196</td>
<td>18,876</td>
<td>262,668</td>
</tr>
<tr>
<td>T5 + sensors</td>
<td>149,084</td>
<td>18,128</td>
<td>262,668</td>
</tr>
<tr>
<td>Double South Glass</td>
<td>150,142</td>
<td>18,276</td>
<td>270,960</td>
</tr>
<tr>
<td>Solar HP Preheater</td>
<td>149,442</td>
<td>18,182</td>
<td>270,960</td>
</tr>
<tr>
<td>Solar Water Heating</td>
<td>146,664</td>
<td>17,796</td>
<td>270,960</td>
</tr>
</tbody>
</table>

The design team considered other options such as even further reductions in floor area, further temperature setpoint reductions in certain rooms with variable occupancy and demand control ventilation for variable occupancy rooms.

**Renewable Energy 5% (0 points earned)**

This credit requires the use of renewables for 5% of the total building energy consumption. The solar heat pump water preheater and the solar water heating system provide 2% of the total building energy needs, therefore this credit is not available.

**Renewable Energy, 10%, 20% (0 points earned)**

These credits allow further points if even higher renewable energy is incorporated within the design.

**Best Practice Commissioning (0 points earned)**

This credit requires a level of commissioning beyond the prerequisite requirements that includes a recommissioning plan, a review of the original commissioning and system operation, and an indoor air quality plan. The design team felt that this level of detail was unnecessary for such a small building.

**Ozone Depletion (1 point earned)**

This credit requires the use of HVAC and refrigeration systems that do not contain HCFC’s. The ground source heat pump systems would not contain HCFCs, therefore this mechanical system complies with this credit requirement.

**Measurement and Verification (1 point earned)**
This LEED requirement includes continuous meter equipment for all major end-use equipment in the building and the development of a Measurement and Verification Plan that incorporates the measured energy use to assist in maintenance, preventative maintenance, control calibration, optimizing energy use and fault detection.

The design will incorporate a building energy management system and the specifications would be developed to ensure that all major energy end uses are separately measured and reported.

**Green Power (1 point earned)**

LEED requires the purchase of 50% of the building’s electricity from verified green sources via a 2 year purchase contract. Prince Edward Island contains a large wind farm on the north cape which Maritime Electric will sell directly to purchasers under a Green Power Agreement. The premium is 2.5 cents per kilowatt hour. The design team felt that this was reasonable and would purchase all electricity under the Green Power Agreement.

This would add another $3700 to the annual electrical bill for the proposed design if all measures are included.

**Energy & Atmosphere: Summary**

The design team made a fundamental effort in redesigning the building to meet the current needs by reducing the floor plate and incorporating efficient and cost effective measures to reduce energy consumption to 46% below the corresponding MNECB reference case. In addition, commissioning and measurement efforts incorporated will ensure that these savings are maintained once the building is built and operated. The design has earned a total of 8 out of a possible 17 LEED points in this category.

**Materials and Resources**

This LEED category considers how the building is constructed and the construction material impacts on the environment. A total of 14 possible LEED points are available.

**Storage and Collection of Recyclable (prerequisite)**

This LEED prerequisite requires the facility to initiate and maintain a comprehensive recycling program. P.E.I. has a government mandated recycling program that exceeds the minimum required under LEED, therefore this required credit is achieved.

**Building Re-use: Maintain 75% or 95% of Existing Envelope, 50% of Interior Elements (0 points earned)**
This LEED credit applies to refurbishing of existing buildings and offers 3 points: maintain 75% of the existing walls, floors and roof, maintain 95% of the existing walls, floors and roofs and maintain 50% of the non-structural interior elements (wall coverings, interior doors, partition walls and ceiling tiles for example).

This design is not eligible for these potential credits.

**Construction Waste Management, 50% and 75% Diversion (2 points earned)**

LEED requires the diversion of construction materials away from landfill and to material separation sites and recycling depots. LEED also requires that the proponent verifies these rates via calculations of total construction waste materials and levels diverted.

The design team felt that both points were possible given the provincial mandate of construction materials must be delivered to a designated material separation site. The design team would consider separate bins for different construction materials which will assist in the validation of the reporting weights.

**Resource Reuse, 5% and 10% Reuse Levels (0 points earned)**

This LEED credit requires the reuse of building materials and products thereby reducing the impact of processing virgin resources. To qualify for the 1 or 2 point credit, the proponent must demonstrate that 5% or 10% of the total cost of building materials is from salvaged materials and this must be validated by the provider.

The design team did not feel confident that this credit would be attainable and meet the scrutiny of an audit.

**Recycled Content of Building Materials, 7.5% and 15% Levels (1 point earned)**

To earn these 1 or 2 points, the team must demonstrate that 7.5% or 15% of the value of all building materials calculated by weight incorporates post-consumer waste. The value is determined by dividing the weight of recycled content in the item by the total weight of the item and then multiplying the resultant percentage by the total cost of the item. This is required for all building materials including steel, cement, concrete, flooring, glazing millwork. Movable items brought into the building after construction such as desks, movable partitions and electronics are exempt from this requirement.

This is a rigorous data collection exercise to keep track of all construction materials, identify their weights, obtain the recycled content during the manufacturing process (ex. steel will have different level of recycled content per mill) and then tabulate this process to determine the percentage post-consumer recycled content by value.

The design team felt confident that the 7.5% value was attainable and could undertake a preliminary investigation of major building materials (steel, concrete, glass, plywood) to assess possible compliance. However the design team felt that attaining the 15% post-consumer recycled content would be difficult.

**Regional Material Use: 10% or 20% Level Extracted/Manufactured Regionally (2 points earned)**
This LEED credit offers points based upon the weight of building materials manufactured locally (within 800 km) of the site. To earn this credit the team must demonstrate that the materials and their component parts are extracted and manufactured within 800 km. For example, a window manufacturing plant in New Brunswick would meet the 800 km requirement, however the aluminum may have been smelted in Ontario and the bauxite would have been extracted in the Caribbean, unless the firm can demonstrate that the aluminum is fully recycled within the 800 km radius. The proponent is required to determine where the material was manufactured and where the resources were obtained in the manufacturing process.

Since the building is primarily wood and concrete, the design team felt that most of the lumber would be sourced from within 800 km, the concrete would be manufactured locally, PEI has a local brick manufacturer, gypsumboard and steel could be sourced from Nova Scotia. The design team would include clauses in tendering documents to obtain the material content and weight and location of materials used in manufacturing.

The team felt that attainment of the 20% level of regional extraction and manufacturing was quite possible, thereby earning 2 points.

**Rapidly Renewable Materials (0 points earned)**

This LEED credit requires the use of 5% of the total dollar value of building materials be made using materials with a material that can regenerate within 10 years. Examples of this include poplar oriented strandboard instead of coniferous based strandboard, bamboo or linoleum flooring.

The design team felt that this credit would be very difficult to obtain given the decision to purchase materials regionally.

**Certified Wood (0 points earned)**

This credit requires the purchase of 50% of wood based products (framing, concrete form work, flooring, furnishings, cladding, trusses, temporary bracing) from forests certified under the Forest Stewardship Council’s Principles and Criteria for FSC certification.

The design team reviewed the forests within 800 km that are FSC certified (www.certifiedwood.org) and felt that the 50% threshold was difficult due to small holdings of FSC-certified lumber. The team considered stipulating FSC-certified wood in tendering documents with formwork and truss manufacturers, but ultimately decided that attainment of this credit was not currently possible.

**Durable Building (0 points earned)**

This LEED credit rewards the use of building materials which have a service life exceeding the design life and which can easily be replaced at the end of their service life. The Canadian Standard Association has developed a guide (CSA S478095 R2001 Guideline on Durability of Buildings) which lists the design life of most building materials. In addition a quality management plan must be developed to allow the
replacement of building components easily once they have reached the end of their service life.

The design team felt that this credit was very difficult to attain given the requirement to prove the service life of materials and assemblies.

**Material/Resource: Summary**

Given that PEI has to import a fair amount of building materials, the attainment of a large number of LEED credits was not possible. The design team felt that current government construction waste requirement supplemented with the LEED requirements and the purchase of a large component of regionally extracted and manufactured materials would be quite feasible, but the other LEED requirements would be very onerous in terms of cost, implementation and verification. As a result the team felt that attainment of 5 out of a possible 14 Material/Resource LEED points was a reasonable expectation.

**Indoor Environmental Quality**

This LEED category deals with design and operation of the building to ensure a very good working environment for occupants and guests. Productivity is directly related to the indoor environment and LEED has considered 15 possible points to reward designs which consider the indoor air and light quality.

**Minimum IAQ Performance (prerequisite)**

The LEED prerequisite requires ventilation systems designed in accordance with ASHRAE-62 Ventilation for Acceptable Indoor Air Quality and Addenda. The exact ASHRAE standard followed is a provincial jurisdiction, however the design engineer indicated that ASHRAE 62-2001 was being followed on this project.

**Environmental Tobacco Smoke Control (prerequisite)**

This LEED prerequisite requires the one of two options to be realized for non-residential buildings:

1. prohibit smoking within the building and establish designated smoking area 7.5 meters away from entrances, ventilation intakes and operable windows;

2. establish designated smoking areas within the building, but design ventilation for these rooms such that air is ducted directly outdoor and the room is placed under a 5 pascal pressure difference from surrounding rooms;

The design team indicated that smoking is not allowed in the building and exterior smoking would conform to the LEED requirements.

**Carbon Dioxide Monitoring (1 point earned)**
The credit requires the installation of a permanent carbon dioxide monitoring system that is linked to the ventilation controls to ensure fresh air for each of the activity areas.

The integration of a CO2 ventilation control system will be considered in the mechanical design as substantial energy savings can be realized by reducing ventilation air to rooms which are not occupied regularly (meeting rooms, council chambers, wellness rooms, future offices, library, lobby). A significant portion of the building will have a variable occupancy, therefore ventilation controls using carbon dioxide are very cost effective. The engineering group will integrate CO2 controls integrated with the building energy management system.

A carbon dioxide monitoring system was not modelled for the Energy and Atmosphere credit because the CBIP requirements for demand control ventilation are more rigorous than LEED. CBIP requires a sensor in each habitable office and room where a scheduled occupancy occurs (storage rooms, washrooms, stairways exempt).

**Ventilation Effectiveness (1 point earned)**

This LEED credit requires the mixing of supply air for comfort following ASHRAE 129-1997 or ASHRAE Fundamentals Chapter 32 (Space Air Diffusion) for mechanically ventilated buildings and ensuring a laminar flow pattern of 90% flow for naturally ventilated areas.

The design team was currently following ASHRAE Fundamentals Chapter 32 in the design of the air handling system and all that is required to is a thorough documentation of air deliveries at the various grilles and how these meet ASHRAE 62 and Chapter 32

**Construction IAQ Management Plan: During Construction (0 points earned)**

This LEED credit requires the use of high efficiency filtering media (MERV of 8) on each of the return grilles during construction, and make provisions for inspections of construction related to IAQ. In addition an Indoor Air Quality Management Plan must be developed for construction and pre-occupancy.

The design team felt that this would require considerable documentation and expense.

**Construction IAQ Management Plan: Testing Before Occupancy (0 points earned)**

This LEED credit requires the removal of particulates, formaldehyde, total volatile organic compounds, carbon monoxide, and 4-phenycyclohexan at required levels following construction and prior to occupancy. An Indoor Air Quality Management Plan is required which must follow one of three options:

1. flush the building prior to occupancy by supplying 4300 m3 of outdoor air per m2 of floor area, while maintaining 16 C and no more than 60% relative humidity and replace filters;

2. flush the building during initial occupancy by supplying 0.045 m3 of outdoor air per m2 of floor area until a total air volume of 4300 m3 of outdoor air per m2 of floor area has been provided and replace filters;
3. Conduct baseline, post-construction indoor air quality testing for the listed pollutants using test protocols consistent with US EPA “Compendium of Methods for the Determination of Air Pollutants in Indoor Air.”

The design team felt that the required commissioning is adequate to ensure good indoor air quality, and that the level of outdoor air flushed through the building was excessive.

**Low Emitting Materials: Adhesives & Sealants (1 point earned)**

LEED credit is available from the use of sealants and adhesives with a Volatile Organic Content less than the limits indicated in the State of California’s South Coast Air Quality Management District Rule #1168 (Oct. 2003). The limit is dependent upon the sealant and adhesive, but for example a cove base adhesive would have a limit of 65 grams VOC per litre of product. Most manufacturers of sealants/adhesives are aware of this requirement.

The design team felt that this requirement would be inserted in the tendering documents, with the manufacturer providing the Material Safety Data Sheets (MSDS) indicated compliance.

**Low Emitting Materials: Paints and Coverings (1 point earned)**

LEED credit is available from the use of paints with a Volatile Organic Content less than the limits indicated in the State of California’s South Coast Air Quality Management District Rule #1113. In addition, paints and coatings must meet the Green Seal requirements related to VOC (GreenSeal’s GS-11 and GS-03 standards). The limit is dependent upon the type of coating and paint addressed in the various standards. For example, Green Seals’s exterior non-flat paint VOC limit is 200 grams by weight per litre of product excluding colours and tints. Most manufacturers are aware of this requirement, and many have product lines which meet these requirements.

The design team felt that this requirement would be inserted in the tendering documents, with the manufacturer providing the Material Safety Data Sheets (MSDS) indicated compliance.

**Low Emitting Materials: Carpets (0 points earned)**

LEED credit is available from the use of carpets with a Volatile Organic Content less than the limits indicated in the Carpet and Rug Institute’s Green Label Indoor Air Quality Test Program and carry the CRI Green Label designation.

The design team indicated that carpeting was not currently included in the design.

**Low Emitting Materials: Composite Wood and Laminate Adhesives (0 points earned)**
The LEED credit requires composite wood, laminates, and wood products contain no urea formaldehyde resins and proof is required via Material Safety Data Sheets or other official literature.

The design team felt that since considerable wood products are used in the building (plywood, strandboard, waferboard, cabinetry), this requirement will be difficult to attain, even if cost was not a barrier.

**Indoor Chemical & Pollutant Source Control (1 point earned)**

This LEED credit focuses on control and management of indoor chemicals and potential hazardous chemicals. To earn this credit the design must complete the following:

1. employ entrance grilles/grates to capture dirt and particulates from entering the building;

2. segregate hazardous gas and chemical area via enclosures and a separate outside exhaust system venting at a rate of 0.5 cubic feet per minute per square foot and no recirculation air and operating at a negative pressure compared to surrounding rooms of 5 pascals with a minimum of 1 pascal when doors to the room are closed.

3. provide containment drains plumbed for the disposal of hazardous liquids;

4. replace all filtration media prior to occupancy with new media have a Minimum Efficiency Reporting Value (MERV) of 13.

The design team agreed with all of these items and would incorporate into the specifications. A design consideration related to the photocopier area, which would require an enclosed vented area. The photocopier would require enclosed walls and a direct vent to comply or possibly the photocopier would be placed in another area such as the records archives area which is already enclosed and only an exhaust vent would be required.

**Controllability of Systems: Perimeter Spaces (1 point earned)**

This LEED credit requires higher levels of thermal, ventilation and lighting system control by occupants. The design must provide one operable window and one lighting control zone (switch or sensor) per 18.5 m² of floor area for all regularly occupied spaces within 5 meters of the perimeter.

The design already incorporates operable windows and lighting control sensors (occupancy and daylighting), therefore this credit is already attained.

**Controllability of Systems: Non-Perimeter Spaces (1 point earned)**

This LEED credit requires higher levels of airflow, temperature and lighting controls for 50% of the non-perimeter regularly occupied spaces.
The layout of the design places most offices on the perimeter with meeting rooms located on interior spaces. The few offices and regularly non-perimeter spaces would already be equipped with lighting occupancy sensors and the heat pump system provides individual thermal comfort control. All that would be required for these spaces would be airflow control, and should the design incorporate demand control ventilation sensors controlling airflow and damper control would be required. The current proposed air handler is a make-up air unit meeting ASHRAE-62 Ventilation requirements and ASHRAE Fundamentals Chapter 32 airflow diffusion, therefore airflow control should be easily accommodated.

**Thermal Comfort: Monitoring (1 point earned)**

LEED requires a monitoring system that measures temperatures and humidity and airflow and provides feedback to the building operator and/or occupants as per ASHRAE 55-2004, Section 7 – Validation of the Thermal Environment.

The design already incorporates these features and these will be connected to the building energy management system

**Thermal Comfort: Compliance (1 point earned)**

This LEED credit requires compliance with ASHRAE 55-2004 Thermal Comfort Conditions for Human Occupancy.

The mechanical design and the building energy management and control system are already designed to be ASHRAE 55 compliant.

**Daylight and Views: Daylight for 75% of Spaces (0 points earned)**

The LEED credit requires a daylight factor of 2% or a 25 footcandle daylight equivalent using a simulation model for 75% of all regularly occupied spaces.

The design would likely meet this requirement as the majority of regularly occupied spaces are positioned on perimeter areas with windows, however the team felt the modelling exercise was not warranted.

**Daylight and Views: Views for 90% of Space (0 points earned)**

The LEED credit requires that 90% of the regular occupied spaces have a sight line (minimum of 10 degrees, 1.27 metres above the floor involving 50% of the space) between the interior and the outdoor via window placements.

The design team felt that this was achievable due to the positioning of offices on perimeter areas and limited office placement within the central core. However, given the inexact location of the windows at this time, the team felt that this credit was borderline at this time.
**Indoor Environmental Quality: Summary**

The design already incorporated many of the LEED requirements within this category and the design team can attain 9 out of a possible 15 LEED points with minimal changes in the design.

**Innovation & Design Process**

This category rewards unique design features which truly stand out and have advanced building science and environmental design. Four innovation credits are available, but the design team felt that this proposed design would not qualify for innovation credits.

The Innovation & Design Process also offers an additional credit if the design team contains a LEED Accredited Professional to assist the process. The design team indicated that it would include a LEED certified professional within the team, thereby earning the credit.

**LEED Summary**

The LEED overall summary for the proposed design with changes for energy efficiency and LEED compliance is as follows:

<table>
<thead>
<tr>
<th>LEED Category</th>
<th>Possible Points</th>
<th>Earned Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Sites</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Water Efficiency</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Energy &amp; Atmosphere</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Materials &amp; Resources</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Innovation &amp; Design</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>34 (Silver)</strong></td>
</tr>
</tbody>
</table>

The design achieved a very high degree of energy/water efficiency within its original design and the design was massaged to accommodate as many LEED credits as cost-effectively possible. The design modifications included a review of the accommodations and space layouts to maximize efficiency, improve occupant comfort and reduce capital costs. The 30% reduction in interior floorspace was achieved at minimal impact to the intended use of the spaces. Certain spaces were reduced, but the majority of spaces incurring reductions were future office spaces, library, wellness rooms and the lobby. The day-to-day operating spaces were effectively maintained, only repositioned. This redesign significantly reduced capital costs (estimate of a $400,000 savings), but equally reduced energy costs (23% reduction or $6000 annually) and annual maintenance costs due to the elimination of lighting fixtures and zonal heat pumps.
This design has effectively demonstrated that common sense, attention to detail, an energy conserving mentality and high regard for the environment and the building occupants and guests that a LEED Silver can be attainment at a value for the community.

4.0 Cornwall Town Hall Participants

David Lopes - Architect - 902-367-4646
Don MacKinnon - Architect - 902 566-1484
Keith Robertson - Architect - Solterre Design - facilitator - 902-492-1215
Tom Ponessa - Architect - SBC - facilitator - 416- 530-4796
Ernie Morello - Landscape Architect - 902-892-5341
Tara Lea - Interior Designer - 902-894-5000
Doug Matheson PEng (Mechanical) - MCA Consultants 902-566-9223
Bob Sear PEng (Electrical) Richardson Associates Ltd. 902- 566-4044
Amber Clark- Richardson Associates
Nedzad Saciragic - Richardson Associates
Neil Lawless PEng (Structural) - Lawless Associates 902-566-9919
Malcom Lodge PEng- Atlantic Orient Wind Turbines 902- 368-7171
Darryl Fisher PEng - ADI Engineering 902-892-0086
Mike Lubun NRCan 613-996-6120
Rocio Rangel, CBIP/LEED Accredited consultant 709-743-0469
David Stewart - CBIP/Energy consultant 902-462-8111
Maurice Satafly Student 902-462-8111
Raymond Murray - Hanscomb- Costing 902-422-3620
Bill Dooley - Cement Association of Canada 902-423-7317
Janice Harper Town Planner- Town of Cornwall 902-629-8412
Robert Hughes (Presenter) Chief Administrator- Town of Stratford 902-569-6251
Jack Kelly - Mayor- Town of Cornwall

Town Council 902-566-2354

Jack Kelly - Mayor
Anne Doucette - Councillor

Irene Dawson - Councillor
Michael Zinck - Councillor
Minerva McCourt - Councillor
Peter Meggs - Deputy Mayor
Parker Beer – Councillor
Rocio Rangel

1. What did you particularly like about the charrette?

I FOUND THE EXERCISE VERY FRUITFUL. IT IS UNCOMMON TO HAVE SUCH NUMBER OF DESIGN PROFESSIONALS UNDER ONE ROOF SHARING IDEAS. THE ENTHUSIASM OF ALL PARTICIPANTS COLD BE FELT. I BELIEVE WE ALL BENEFITED FROM SHARING OUR KNOWLEDGE. I PARTICULARLY ENJOYED HAVING PEOPLE WITH DIFFERENT BACKGROUNDS TOGETHER. THIS MADE THE EXPERIENCE SO MUCH RICHER. WE WERE ABLE TO ANALYZE PROBLEMS FROM DIFFERENT POINTS OF VIEW.

2. What did you think didn’t work so well?

I REALLY CAN'T THINK OF ANYTHING I DISLIKED. THE SESSIONS WERE PROPERLY PLANNED. WE HAD ENOUGH TIME TO ANALYZE THE PROBLEM AT HAND AND COME UP WITH VERY CONCRETE SOLUTIONS. THIS, I THINK, IS EXTREMELY IMPORTANT.

3. What suggestions would you make for improving the event in future?

THIS IS THE FIRST DESIGN CHARETTE (OF THIS KIND) I HAVE HAD THE PLEASURE OF PARTICIPATING IN. AS SUCH, IT IS DIFFICULT FOR ME TO FIND WAYS IN WHICH IT COULD BE IMPROVED. I CAN ONLY SAY I WAS VERY PLEASED WITH THE SESSIONS. IT WAS A VERY FRUITFUL EXPERIENCE AND HOPE I CAN PARTICIPATE IN MORE EVENTS LIKE THIS IN THE FUTURE.

Keith Robertson

1. What did you particularly like about the charrette? I was most impressed with the commitment and participation of the town council.

2. What did you think didn't work so well? There was some duplication of effort of energy modellers for each team.

3. What suggestions would you make for improving the event in future? While it presents different challenges, it would be interesting to be a bit more conceptual in approach, rather than doing what is more of a peer review of a schematic design.

Janice Harper

1. I like meeting informally the evening prior to the event. I liked hearing about the Stratford experience. I liked the resulting plans, and the comparisons to a standard building. I liked the process of sharing ideas among professionals. I really liked the innovative ideas from the team (such as Doug Matheson's hybrid solar/geo thermal heat pump). I liked the high level of participation from the local design team.

2. What did not work so well, for me, was finding a way to incorporate residents into the process. I think that anyone who was participating walked away believing in a better building. However, I struggle to find ways to communicate that buy in to the local residents. (Maybe that is the politician's role.)

3. To improve the event in the future I would spend more time on Public Relations before the event. I would have name tags for every day! I would not hold such an intensive event in a basement meeting room.